Bendix
Aerospace
Systems Division

NO.	REV. NO.
ATM 841	

Parts Application Analysis
S-Band Transmitter

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DATE 10/28/69

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The purpose of this ATM is to document the Parts Application Analysis (PAA) for the S-Band transmitter designed and manufactured by the Bendix Aerospace Systems Division for use in ALSEP Flight System 2A.

It has been established by this analysis that all electrical and electronic parts used in the transmitter are being operated within their functional and environmental stress level limits prescribed for hi-rel application by Bendix document ATM 241, Acceptable Parts List for ALSEP.

The ALSEP Flight System 2A will have two S-Band transmitters located within the central station where the thermal control system is assumed to control the temperature variation from -10° F to +140° F. Failure rates shown in this PAA are based on ATM 605 Appendix A to compensate for this temperature delta.

Part and assembly level failure rate data provided by this PAA also serves as the basis for transmitter reliability prediction and the criticality ranking factors used in the Failure Modes, Effects, and Criticality analysis of the transmitters.

The data contained herein defines all transmitter parts less the current, temperature, and RF telemetery. Telemetery has been omitted for this PAA issue as the circuitry has not been released.

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Approved by S. J. Ellison
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PARTS APPLICATION ANALYSIS

CAPACITORS

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUBASSEMBLY: Osc. Buffer-Mult.

SCHEMATIC NO: BSX 10101

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage Ratio, Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) At 25°C (See Below)	13 Special Environment (Define)	14 Failure Rate Multiplier	15 Final Failure Rate	16 Total Capacitor Count Per Type	17 Total Failure Rate (%/1000 Hrs)	18
			Pfd.										Level					
C1	ECY 15		1000		300	29	.10					A	Lunar	R			.00004	
C2	ECY 10		150		500	5	.01					A						
C3	"		39		500	14	.03					A						
C4	ECY 10		150		500	5	.01					A						
C5	ECY 10		20		500	--	---					A		R			.00004	
C6	JMC		.8-10		250	14	.03					B					.0003	
C7	JMC		.8-10		250	29	.06					B					.0003	
C8	ECY 10		180		500	8						A		R			.00004	
C9	"		47		"	20	.04					A						
C10	"		68		"	9	.02					A						
C11	"		11		500	14	.03					A					.00004	
C12	CKR 06		.1μf		200	29	.15					A					.00005	
C13	ECY 10		39		500							A		R			.00004	
C14	JMC		.8-10		250	4	.015					B					.0003	
C15	ECY 10		22		500	4	.01					A		R			.00004	
C16	"		47		500	29	.06					A		R			.00004	
C17	JMC		.8-10		250	2	.008					B					.0003	
C18	ECY 10		4.3		500	4	.01					A	Lunar	R			.00004	

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B ATM 711

C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .00177 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUBASSEMBLY: Osc. -Buff. -Mod.

SCHEMATIC NO: BSX 10101

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value Pfd.	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage/Rating Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) At 25°C Ambient (See Below)	13 Special Environment (Define)	14 Failure Rate Multiplier Level	15 Final Failure Rate	16 Total Capacitor Count Per Type	17 Total Failure Rate (%/1000 Hrs)
C19	ECY 10		47		500	29	.06					A	Lunar	R			.00004
C20	"		47			16	.03					A		R			
C21	"		82			8	.016					A		R			
C22	"		82		500	8	.016					A		R			.00004
C23	JMC		.8-10		250	15	.06					B		R			.0003
C24	ECY 10				500	15	.03					A		R			.00004
C25	JMC		.8-10		250	16	.06					B					.0003
C26	ECY 10		82		500	16	.03					A		R			.00004
C27	ECY 15		1000		300	14	.03					A	Lunar	R			.00004

FOR USE OF RELIABILITY DEPT.

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B ATM 711

C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .00088 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Osc.-Buffer-Mult.

SCHEMATIC NO: BSX 10101

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS) mw	MAXIMUM OPERATING POWER (WATTS) mw	7 POWER RATIO OPERATING/ RATED	8 MAXIMUM DUTY CYCLE	9 BULK AIR TEMPERATURE °C	10 CIRCUIT FUNCTION OR APPLICATION	11 BASIC FAILURE RATE (%/1000 HRS) AT 25°C SOURCE (SEE BELOW)	12 FOR USE OF RELIABILITY DEPT	13 SPECIAL ENVIRONMENTS (DEFINE)	14 FAILURE RATE MULTIPLIER Level	15 FINAL FAILURE RATE (%/1000 HRS)	16 TOTAL RESISTOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)	18
R1	RCR		1K		250	4.84	<.025				A			S			.000167	
R2			4.7K			22.5	<.10											
R3			10K			9	.05											
R4			750			31	.12											
R5			2.2K			<1.0	.01											
R6			4.7K			<2.0	.01											
R7			100K			<1.0	.01											
R8			120K			NEG												
R9			36K			NEG												
R10			43K			NEG												
R11			12			<1.0	.01											
R12			7.5K			22	.10											
R13			39			<1.0	.01											
R14			22			<1.0	.01											
R15			1.5K			1.0	.01											
R16			4.7K			14	.06											
R17			4.7K			14	.06											
R18			1.5K		250	36	.14										.000167	

Lunar

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .003 %/1000 HRS

FORM 9031

BS-321A

PARTS APPLICATION ANALYSIS

ATM 841

RESISTORS

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Osc.-Buffer-Mult.

SCHEMATIC NO: BSX 10101

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (MILLIWATTS)	8 POWER RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R19	RCR 07		20		250	40	.01					A	Lunar				.000167

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)
A ATM 605 B
C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000167 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Osc.-Buff.-Mod.

SCHEMATIC NO: BSX 10101

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: JUNCTION RATED T_J (5)	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT (7)	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE (8)	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A (9)	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C (10)	AVG PWR DISSIPATION (mw): ACTUAL (11)	POWER RATIO: ACTUAL/RATED 25°C (Amb. or case) (12)	POWER RATIO: ACTUAL T_A or T_C / RATED T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	MAXIMUM VOLTAGES: V_{CB} ACTUAL V (15)	MAXIMUM VOLTAGES: V_{CEO} RATED V (16)	MAXIMUM VOLTAGES: V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	DIODE PIV: ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL RATE (%/1000 HRS) (25)	TOTAL PER TYPE (26)	COUNT (26)	TOTAL FAILURE RATE (%/1000 HRS) (27)
CR1	1N944B			175		550				17.6	.035												A						.00039
CR2	1N751A			175		400				10.2	.025																		.00039
CR3	1N5140A			175		400				NEG	.01																		.00013
CR4	HP0180			200		400				4	.01											LUNAR							.00013
XTAL1	MC Coy Crystal																												.003

(30) FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

(29) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(30) TOTAL FAILURE RATE .00404 %/1000 HRS.

9248A

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

ATM 841

PROJECT: ALSEP

DATE: 9/22/69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Osc-Buff-Mult

SCHEMATIC NO: BSX 10101

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: JUNCTION RATED T_J (5)	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT (7)	RATED AT 25°C: CASE (8)	ACTUAL: AMBIENT T_A (9)	ACTUAL: CASE T_C (10)	ACTUAL (11)	POWER RATIO: ACTUAL RATED 25°C (Amb.or case) (12)	ACTUAL T_A or T_C RATED (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	V_{CB} ACTUAL V (15)	V_{CEO} RATED V (16)	V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FAIL. RATE (%/1000 HRS) (25)	TOTAL PER TYPE (26)	COUNT (26)	TOTAL FAILURE RATE (%/1000 HRS) (27)
Q1	2N918			200		300				104	.34												A					.00029
Q2	2N918			200						59	.20																	.00014
Q3	2N918			200						65	.22																	.00014
Q4	2N918			200		300				40	.13										LUNAR							.00014

(28) FAILURE RATE SOURCE (See Column 23)
A ATM 605
B
C
D

(29) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(30) TOTAL FAILURE RATE .00017 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

ATM 841

PROJECT: ALSEP **DATE:** 9/22/69

ASSEMBLY: S-Band Transmitter **SUB ASSEMBLY:** Osc-Buff-Mod **SCHEMATIC NO:** BSX 10101

(Inductors & Transformers)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION 2340319	3 MANUFACTURER	CONSTRUCTION 4 TYPE OF CASE (SEE BELOW)	5 WIRE SIZE, PRIMARY	6 WIRE SIZE, SECONDARY	7 INSULATION CLASS	8 VA RATING	9 INDUCTANCE AT RATED CUR.	10 SPECIFIED FREQ	11 MISCELLANEOUS	TEMPERATURE (°C) 12 OPERATING AMBIENT (HOT SPOT (SURFACE))	13 RISE (ΔR METHOD)	14 RISE EST. ACTUAL	15 OPERATING TEMP MAX.	PRIMARY CURRENT 16 ACTUAL	17 RATED	18 PRIMARY VOLTAGE	19 SECONDARY NO. WINDINGS	20 WINDING NO.	21 VOLTAGE	22 WINDINGS	HIPOT READING 23 VOLTS	24 BASIC FAILURE RATE (%/1000 HRS) — 25 SOURCE (SEE BELOW)	26 TOTAL FAILURE RATE (%/1000 HRS)
							µh																	REL. DEPT USE ONLY	
L1	RF Coil	Delevan					4.7																	A	.002
L2							.47																		
L3							.12																		
L4							.47																		
L5		BxA																							
L6		Delevan					.68																		
L7		Delevan					.1																		
L8	RF Coil	BxA																						A	.002

28 TYPE OF CASE
A. HER. SEAL
B. VAC. IMP.
C. ENCAP.
D. OPEN

29 FAILURE RATE SOURCES (FOR COLUMN #25)
A. MIL-HDBK-217A B. _____
C. _____ D. _____

30 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .016 %/1000 HRS

NAS Form 9248

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

ATM 841

PROJECT: ALSEP

DATE: 9/22/69

ASSEMBLY: S-Band Transmitter

SUBASSEMBLY: Preamp

SCHEMATIC NO: BSX 10109

(Capacitors)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	4 Capacitance Value pfd	5 Tolerance %	6 Manufacturer's Rated Voltage	7 Operating Voltage DC	7 Operating Voltage Peak AC	8 Voltage Ratio, Operating/Rated	9 Maximum Duty Cycle	10 Bulk Air Temperature (°C)	11 Circuit Function or Application	12 Basic Failure Rate (%/1000 Hrs) At 35°C (See Below)	13	14 Special Environment (Defined) level	15 Failure Rate Multiplier	16 Final Failure Rate	17 Total Capacitor Count Per Type	18 Total Failure Rate (%/1000 Hrs)	19
C1	ECY 10		47		500	29	.06					A		Lunar	R			.00004	
C2	"		47			29	.06								R				
C3	"		47			16	.03								R				
C4	"		82		500	8	.016					A			R			.00004	
C5	JMC		.8-10		250	22	.088					B			R			.0003	
C6	ECY 10		5.6		500	7	.014					A			R			.00004	
C7	"		82			16	.032								R				
C8	"		82			8	.016								R				
C9	"		47		500	29	.058					A			R			.00004	
C10	JMC		.8-10		250	16	.032					B						.0003	
C11	ECY 10		47		500	6.5	.013					A			R			.00004	
C12	JMC		.8-10		250	15	.03					B						.0003	
C13	ECY 10		5.6		500	15	.03					A		Lunar	R			.00004	

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B ATM 711

C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0013 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

ATM 841

(Resistors)

PROJECT: ALSEP

DATE: 9/22/69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Modulator

SCHEMATIC NO: BSX 10105

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	TOLERANCE (%)	5 POWER RATING (WATTS)	6 MAXIMUM OPERATING POWER mw	7 POWER RATIO OPERATING/ RATED	8 MAXIMUM DUTY CYCLE	9 BULK AIR TEMPERATURE °C	10 CIRCUIT FUNCTION OR APPLICATION	11 BASIC FAILURE RATE (%/1000 HRS) @ T °C SOURCE (SEE BELOW)	12	13 SPECIAL ENVIRONMENTS (DEFINE)	14 FAILURE RATE MULTIPLIER	15 FINAL FAILURE RATE (%/1000 HRS)	16 TOTAL RESISTOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)	18
R1	RCR 07		56		.25	NEG		100%				A	Lunar				.000167	
R2			20			NEG												
R3			100K			NEG												
R4			15			NEG												
R5			120			NEG												
R6			68			NEG		100%										
R7			10K			1.2	.01	50%										
R8			100K			90	.36										.000167	
R9			10K			62.5	.25										.000217	
R10	RCR 07		100K		.25	2.25	NEG	50%				A	Lunar				.000167	

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 607 B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .00172 %/1000 HRS

FORM 9221

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

ATM 841

PROJECT: ALSEP

DATE: 9/22/69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Modulator

SCHEMATIC NO: BSX 10105

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED 25°C (Amb or case)	POWER RATIO: ACTUAL/RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL RATE (%/1000 HRS)	FAIL. TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
CR1	1N5140 A			175		400				Neg	.01											A					.00013
CR2	1N914			175		65				2	.04											A					.00013
CR3	1N944 B			175		550				9	.02										LUNAR	A					.00039

FAILURE RATE SOURCE (See Column 23)
A ATM 605
B
C
D

NOTE: It is assumed the transient and peak power does not exceed the safe limit.

TOTAL FAILURE RATE .00065 %/1000 HRS.

9249A

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

ATM 841

PROJECT: ALSEP

ASSEMBLY: S -Band Transmitter

SUB ASSEMBLY: Modulator

DATE: 9/22/69

SCHEMATIC NO: BSX 10105

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: JUNCTION RATED T_J (5)	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT (7)	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE (8)	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A (9)	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C (10)	AVG PWR DISSIPATION (mw): ACTUAL (11)	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case) (12)	POWER RATIO: ACTUAL/RATED T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	MAXIMUM VOLTAGES: V_{CB} ACTUAL V (15)	MAXIMUM VOLTAGES: V_{CEO} RATED V (16)	MAXIMUM VOLTAGES: V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	DIODE PIV: ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL FAIL. RATE (%/1000 HRS) (26)	TOTAL COUNT PER TYPE (27)	TOTAL FAILURE RATE (%/1000 HRS) (27)
Q1	2N2222 A			175		500				.06	Neg												A					.00019
Q2	2N3251 A			200		360				.6	Neg												A					.00061
																						LUNAR							

(28) FAILURE RATE SOURCE (See Column 23)

A ATM 605 C

B D

(29) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(30) TOTAL FAILURE RATE .0008 %/1000 HRS.

P249A

BS-321A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

ATM 841

PROJECT: ALSEP

DATE: 9/22/69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Modulator

SCHEMATIC NO: BSX 10105

(Inductors & Transformers)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	CONSTRUCTION 4 TYPE OF CASE (SEE BELOW)	5 WIRE SIZE, PRIMARY	6 WIRE SIZE, SECONDARY	7 INSULATION CLASS	8 VA RATING	9 INDUCTANCE AT RATED CUR.	10 SPECIFIED FREQ	11 MISCELLANEOUS	TEMPERATURE (°C) 12 OPERATING AMBIENT (HOT SPOT (SURFACE))	13 RISE (AR METHOD)	14 EST. ACTUAL RISE	15 OPERATING TEMP MAX.	PRIMARY CURRENT 16 ACTUAL	17 RATED	18 PRIMARY VOLTAGE	19 SECONDARY NO. WINDINGS	20 WINDING NO.	21 VOLTAGE	22 WINDINGS	HIPOT READING 23 VOLTS	24 BASIC FAILURE RATE (%/1000 HRS)	25 SOURCE (SEE BELOW)	26 TOTAL FAILURE RATE (%/1000 HRS)	27 REL. DEPT USE ONLY
								mh																		
L1	RF Coil	Delevan						1.0																	A	.002
T1	RF X former																								A	.002

28 TYPE OF CASE
A. HER. SEAL
B. VAC. IMP.
C. ENCAP.
D. OPEN

29 FAILURE RATE SOURCES (FOR COLUMN #26)
A. MIL-HDBK-217 A B.
C. D.

30 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .004 %/1000 HRS

IRD FORM 9248

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

ATM 841

PROJECT: ALSEP

DATE: 9/22/69

ASSEMBLY: S-Band Transmitter

SUBASSEMBLY: Modulator

SCHEMATIC NO: BSX 10105

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE pfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) λb (CIRCLE ONE BELOW)	13 SPECIAL ENVIRONMENT (DEFINE)	14 FAILURE RATE MULTIPLIER level	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (%/1000 HRS)
C1	ECY 10		56		500	29	.06					A	Lunar	R			.00004
C2	"		56		500	9.0	.018					A		R			.00004
C3	JMC		.8-10		250	20	.04					B					.0003
C4	CKR06		.1MF		200		NEG					A		R			.00005
C5	CKR06		.1MF		200		NEG					A		R			.00005
C6	ECY 10		62		500	9	.02					A	Lunar	R			.00004

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B ATM 711

C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .00052 % 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

ATM 841

(Resistors)

PROJECT: ALSEP

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Preamp

DATE: 9/22/69

SCHEMATIC NO: BSX 10109

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS) MW	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 50% C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR 07		15	.25	Neg						A		Lunar				.000167
R2			7.5k		22	.10											
R3			1.5k		Neg												
R4			4.7k		14	.065											
R5			4.7k		14	.065											
R6			1.5k		36	.14											
R7			33k		14.6	.06											
R8			10k		4.5	.02											.000167
R9	RCR 07		620	.25	66	.26					A		Lunar				.000217

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B _____

C _____ D _____

20 CALCULATED MTBF _____ HRS

21 TOTAL FAILURE RATE .001553 %/1000 HRS

FORM 0031

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Preamp

SCHEMATIC NO: BSX 10109

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: JUNCTION RATED T_J (5)	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT (7)	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE (8)	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A (9)	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C (10)	AVG PWR DISSIPATION (mw): ACTUAL (11)	POWER RATIO: ACTUAL RATED 25°C (Amb.or case) (12)	POWER RATIO: ACTUAL RATED T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	MAXIMUM VOLTAGES: V_{CB} ACTUAL V (15)	MAXIMUM VOLTAGES: V_{CEO} RATED V (16)	MAXIMUM VOLTAGES: V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	DIODE PIV: ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL FAIL RATE (%/1000 HRS) (25)	TOTAL COUNT PER TYPE (26)	TOTAL FAILURE RATE (%/1000 HRS) (27)
Q1	2N918			200		300				70	.23										Lunar		A				.00014
Q2	2N918			200		300				40	.13												A				.00014
Q3	2N3866			200		3.5W				230	.065												A				.00026

(28) FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

(29) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(30) TOTAL FAILURE RATE .00054 %/1000 HRS.

92404

BS-321A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

ATM 841

PROJECT: ALSEP

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Preamp

DATE: 9/22/69

SCHEMATIC NO: BSX 10109

(Inductors & Transformers)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	CONSTRUCTION 4 TYPE OF CASE (SEE BELOW)	5 WIRE SIZE, PRIMARY	6 WIRE SIZE, SECONDARY	7 INSULATION CLASS	8 VA RATING	9 INDUCTANCE AT RATED CUR.	10 SPECIFIED FREQ	11 MISCELLANEOUS	TEMPERATURE (°C) 12 OPERATING AMBIENT	13 HOT SPOT (SURFACE)	14 RISE (ΔR METHOD)	15 EST. ACTUAL RISE	16 OPERATING TEMP MAX.	PRIMARY CURRENT 17 ACTUAL	18 RATED	19 PRIMARY VOLTAGE	SECONDARY 20 NO. WINDINGS	21 WINDING NO.	22 VOLTAGE	23 WINDINGS	HIPOT READING 24 VOLTS	25 BASIC FAILURE RATE (%/1000 HRS) — λb	26 SOURCE (SEE BELOW) — C	27 TOTAL FAILURE RATE (%/1000 HRS)
							μh																	REL. DEPT USE ONLY		
L1	RF Coil	Delevan					.68																	A	.002
L2		Delevan					.1																		
L3		BxA																							
L4		Delevan					1.0																		
L5		Delevan					.15																		
L6	RF Coil	Delevan					.15																	A	.002

28 TYPE OF CASE
A. HER. SEAL
B. VAC. IMP.
C. ENCAP.
D. OPEN

29 FAILURE RATE SOURCES (FOR COLUMN #26)
A. MIL-HDBK-217 A B. _____
C. _____ D. _____

30 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .012 %/1000 HRS

DD FORM 9248

PARTS APPLICATION ANALYSIS

CAPACITORS

ATM 841

PROJECT: ALSEP

DATE: 9/22/69

ASSEMBLY: S-Band Transmitter

SUBASSEMBLY: Power Amp. (A2)

SCHEMATIC NO: BSX 9793

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE pfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	7 OPERATING VOLTAGE PEAK AC	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (% / 1000 HRS) TC (°C) (SEE BELOW)	13 SPECIAL ENVIRONMENT (DEFINE)	14 FAILURE RATE MULTIPLIER level	15 FINAL FAILURE RATE	16 TOTAL CAPACITOR COUNT PER TYPE	17 TOTAL FAILURE RATE (% / 1000 HRS)
C1	JMC	Johanson	.8-10		250	Neg	Neg	100%				B					.00062
C2	JMC	"	.8-10		250	Neg						B					.00062
C3	ECY	Corning	5.6		500	Neg						A		R			.000004
C4	Filter	Erie	NA		200	Neg	Neg					A		R			.000005
C5	Filter	Erie	NA		200	29	.145					A		R			.000005
C6	ECY	Corning	39		500	Neg	Neg					A		R			.000004
C7	JMC	Johanson	.8-10		250	29	.116					B					.00062
C8	Filter	Erie	NA		200	29	.145					A		R			.000005
C9	JMC	Johanson	8-10		250	Neg	Neg					B					.00062
C10	ECY	Corning	12		500							A		R			.000004
C11	JMC	Johanson	.8-10		250							B					.00062
C12	ECY	Corning	62		500							A		R			.000004
C13	JMC	Johanson	.8-10		250							B					.00062
C14	"	"	.8-10		250	Neg	Neg					B					.00062
C15	"	"	.8-10		250	29	.116					B					.0016
C16	Filter	Erie	NA		200	29	.145					A		R			.000005
C17	JMC	Johanson	.8-10		250	Neg	Neg					B					.00062
C18	Filter	Erie	NA		200	29	.145					A		R			.000005
C19	JMC	Johanson	.8-10		250	29	.116	100%				B					.0016

FOR USE OF RELIABILITY DEPT. LUNAR

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B ATM 711

C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .005195 % / 1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

CAPACITORS

ATM 841

PROJECT: ALSEP

ASSEMBLY: S-Band Transmitter SUBASSEMBLY: Power Amp (A2)

DATE: 9/22/69

SCHEMATIC NO: BSX 9793

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE pfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE	7 OPERATING VOLTAGE DC	8 OPERATING VOLTAGE PEAK AC	9 VOLTAGE RATIO, OPERATING/ RATED	10 MAXIMUM DUTY CYCLE	11 BULK AIR TEMPERATURE (°C)	12 CIRCUIT FUNCTION OR APPLICATION	13 BASIC FAILURE RATE (%/1000 HRS) At °C (SEE BELOW)	14	15 SPECIAL ENVIRONMENT (DEFINE) level	16 FAILURE RATE MULTIPLIER	17 FINAL FAILURE RATE	18 TOTAL CAPACITOR COUNT PER TYPE	19 TOTAL FAILURE RATE (%/1000 HRS)
C20	JMC	Johanson	.8-10		250	29	12	.116	100%			B						.0016
C21	Filter	Erie	NA		200	29		.145	100%			A		R				.000005

LUNAR

FOR USE OF RELIABILITY DEPT

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B ATM 711

C D

21 CALCULATED MTBF _____ HRS

22 TOTAL FAILURE RATE .001605 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

ATM 841

PROJECT: ALSEP

DATE: 9/22/69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Power Amp (A2)

SCHEMATIC NO: BSX 9793

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) λ_T @ 25°C SOURCE (SEE BELOW)	13 FOR USE OF RELIABILITY DEPT	14 SPECIAL ENVIRONMENTS (DESTINES)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	MIL-A-39008		470	5.0	.25	Neg	Neg	100%			A			S			.000167
R2	(Level "S")		20			.008	Neg										.000167
R3			1K			.112	.448										.000232
R4			220			.120	.48										.000263
R5			15			Neg	Neg										.000167
R6			1K			.0024							LUNAR				
R7			1K			.0024											
R8			27			Neg											
R9			18			Neg											.000167

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B

C D

20 CALCULATED MTBF _____ HRS

21 TOTAL FAILURE RATE .00166 %/1000 HRS

FORM 0021

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Power Amp (A2)

SCHEMATIC NO: BSX 9793

(Semiconductors)

CKT SYM NO.	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY	MANUFACTURER	MAX. TEMP °C: AMBIENT ACTUAL T_A	MAX. TEMP °C: JUNCTION RATED T_J	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C	AVG PWR DISSIPATION (mw): RATED AT 25°C: AMBIENT	AVG PWR DISSIPATION (mw): RATED AT 25°C: CASE	AVG PWR DISSIPATION (mw): ACTUAL: AMBIENT T_A	AVG PWR DISSIPATION (mw): ACTUAL: CASE T_C	AVG PWR DISSIPATION (mw): ACTUAL	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case)	POWER RATIO: ACTUAL/RATED T_A or T_C	MAXIMUM VOLTAGES: V_{CBO} RATED V	MAXIMUM VOLTAGES: V_{CB} ACTUAL V	MAXIMUM VOLTAGES: V_{CEO} RATED V	MAXIMUM VOLTAGES: V_{CE} ACTUAL V	DIODE PIV: RATED V	DIODE PIV: ACTUAL V	CIRCUIT FUNCTION or APPLICATION	PART SPECIAL ENVIRONMENT (Define)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS)	SOURCE (See below)	FAIL. RATE	MULTIPLIER	FINAL FAIL. RATE (%/1000 HRS)	TOTAL COUNT PER TYPE	TOTAL FAILURE RATE (%/1000 HRS)
Q1	2N3866	RCA	LUNAR	200		5W				360	.072												A					.0002994
Q2	2N3866	RCA		200		5W				540	.108												A					.0003180
Q3	2N3375	RCA		200		11.6W				1.33W	.147											LUNAR	A					.0003660
Q4	2N3375	RCA		200		11.6W				4.38W	.265												A					.0004010

28 FAILURE RATE SOURCE (See Column 23)
A ATM 605 C
B D

29 NOTE: It is assumed the transient and peak power does not exceed the safe limit.

30 TOTAL FAILURE RATE .0013844 %/1000 HRS.

P248A

BS-321A

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

ATM 841

PROJECT: ALSEP **DATE:** 9-22-69

ASSEMBLY: S-Band Transmitter **SUB ASSEMBLY:** Power Amp (A2) **SCHEMATIC NO:** BSX 9793

(Inductors & Transformers)

1 Circuit Symbol Number	2 Type Designation (Mil or Mfr) and Construction	3 Manufacturer	Construction 4 Type of Case (See Below)	5 Wire Size, Primary AWG#	6 Wire Size, Secondary	7 Insulation Class	8 VA Rating µh	9 Inductance at Rated Cur.	10 Specified Freq	11 Miscellaneous	Temperature (°C) 12 Operating Ambient (Hot Spot, Surface)	13 Rise (Air Method)	14 Est. Actual Rise	15 Operating Temp Max.	Primary Current 16 Actual	17 Rated	18 Primary Voltage	19 No. Windings	Secondary 20 Winding No.	21 Voltage	22 Windings	Hipot Reading 23 Volts	24 Basic Failure Rate (λb/1000 Hrs)	25 Source (See Below)	26 Total Failure Rate (λ/1000 Hrs)	27
																							REL. DEPT USE ONLY			
L1		BxA																					A		.002	
L2	BP-1551-110	Collins Radio	C	#40			1.0																			
L3	"	"	C	#40			1.0																			
L4		BxA					062																			
L5	BP-1551-110	Collins Radio	C	#40			1.0																			
L6		BxA																								
L7		"					.03																			
L8		"					.03																			
L9		"					.02																			
L10	BP-1551-010	Collins Radio	C	#33			.15																			
L11	BP-1551-050	"	C	#35			.33			LUNAR		NEG														
L12		BxA					.04																			
L13	BP-1551-010	Collins Radio	C	#33			.15																			
L14	BP-1551-050	"	C	#35			.33																			
L15		BxA					.025																			
L16	BP-1551-110	Collins Radio	C	#40			1.0																			
L17	BP-1551-110	Collins Radio	C	#40			1.0																			
L18		BxA																								
L19	BP-1551-050	Collins Radio	C	#35			.33																			.002

28 TYPE OF CASE
A. HER. SEAL
B. VAC. IMP.
C. ENCAP.
D. OPEN

29 FAILURE RATE SOURCES (FOR COLUMN 926)
A. MIL-HDBK-217A B. _____
C. _____ D. _____

30 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .038 %/1000 HRS

NPO Form 9248

PARTS APPLICATION ANALYSIS

(INDUCTORS & TRANSFORMERS)

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Power Amp (A2)

SCHEMATIC NO: BSX 9793

(Inductors & Transformers)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	CONSTRUCTION 4 TYPE OF CASE (SEE BELOW)	5 WIRE SIZE PRIMARY (AWG#)	6 WIRE SIZE SECONDARY	7 INSULATION CLASS	8 VA RATING	9 INDUCTANCE AT RATED CUR. (μh)	10 SPECIFIED FREQ	11 MISCELLANEOUS	TEMPERATURE (°C) 12 OPERATING AMBIENT	13 HOT SPOT (SURFACE) RISE	14 (AIR METHOD) EST. ACTUAL RISE	15 OPERATING TEMP MAX.	PRIMARY CURRENT 16 ACTUAL	17 RATED	18 PRIMARY VOLTAGE	19 NO. WINDINGS	SECONDARY 20 WINDING NO.	21 VOLTAGE	22 WINDINGS	HIPOT READING 23 VOLTS	24	25 BASIC FAILURE RATE (λb/1000 HRS) — λb = λc (SOURCE (SEE BELOW))	26 TOTAL FAILURE RATE (λ/1000 HRS)
																									REL. DEPT USE ONLY	
L20	BP-1551-050	Collins Radio	C	#35			.33																		A	.002
L21	BP-1551-050	"	C	#35			.33																		A	.002
L22	BP-1551-050	"	C	#35			.33																		A	.002

LUNAR

28 TYPE OF CASE
A. HER. SEAL
B. VAC. IMP.
C. ENCAP.
D. OPEN

29 FAILURE RATE SOURCES (FOR COLUMN #26)
A. MIL-HDBK-217A B. _____
C. _____ D. _____

30 CALCULATED MTBF _____ HRS

31 TOTAL FAILURE RATE .006 %/1000 HRS

PARTS APPLICATION ANALYSIS

CAPACITORS

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUBASSEMBLY: Frequency Mult.

SCHEMATIC NO: NA

(Capacitors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 CAPACITANCE VALUE pfd	5 TOLERANCE %	6 MANUFACTURER'S RATED VOLTAGE DC	6 MANUFACTURER'S RATED VOLTAGE PEAK AC	7 OPERATING VOLTAGE	8 VOLTAGE RATIO, OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE (°C)	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 25°C (SEE BELOW)	13 SOURCE	14 SPECIAL ENVIRONMENT (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE	17 TOTAL CAPACITOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
C 1	#4891(Modified)	Johnson	1-20		250	NEG						A						.0003
C 2	#2950		8-10															
C 3	#4891 (Modified)		1-20															
C 4	#2950		8-10															
C 5	#2950																	
C 6	#2950																	
C 7	#2950																	.0003

FOR USE OF RELIABILITY DEPT.

LUNAR

20 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B

C D

21 CALCULATED MTBF HRS

22 TOTAL FAILURE RATE .0021 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

RESISTORS

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Freq. Mult.

SCHEMATIC NO: NA

(Resistors)

1 CIRCUIT SYMBOL NUMBER	2 TYPE DESIGNATION (MIL or MFR) AND CONSTRUCTION	3 MANUFACTURER	4 RESISTANCE VALUE (OHMS)	5 TOLERANCE (%)	6 POWER RATING (WATTS)	7 MAXIMUM OPERATING POWER (WATTS)	8 POWER RATIO OPERATING/ RATED	9 MAXIMUM DUTY CYCLE	10 BULK AIR TEMPERATURE °C	11 CIRCUIT FUNCTION OR APPLICATION	12 BASIC FAILURE RATE (%/1000 HRS) AT 40°C	13 SOURCE (SEE BELOW)	14 SPECIAL ENVIRONMENTS (DEFINE)	15 FAILURE RATE MULTIPLIER	16 FINAL FAILURE RATE (%/1000 HRS)	17 TOTAL RESISTOR COUNT PER TYPE	18 TOTAL FAILURE RATE (%/1000 HRS)
R1	RCR 07		47K		.25		NEC				A		Lunar				.000167
R2	RCR 07		10K		.25		NEC				A		Lunar				.000167

FOR USE OF RELIABILITY DEPT

19 FAILURE RATE SOURCES (FOR COLUMN #14)

A ATM 605 B

C D

20 CALCULATED MTBF HRS

21 TOTAL FAILURE RATE .000334 %/1000 HRS

BS-321A

PARTS APPLICATION ANALYSIS

(SEMICONDUCTORS)

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Freq. Mult.

SCHEMATIC NO: NA

(Semiconductors)

CKT SYM NO. (1)	TYPE DESIGNATION, SEMICONDUCTOR, POLARITY (2)	MANUFACTURER (3)	MAX. TEMP °C: AMBIENT ACTUAL T_A (4)	MAX. TEMP °C: JUNCTION RATED T_J (5)	MAX. TEMP °C: CASE ACTUAL HOT SPOT T_C (6)	AVG PWR DISSIPATION (mw): RATED AT 25°C AMBIENT (7)	AVG PWR DISSIPATION (mw): RATED AT 25°C CASE W (8)	AVG PWR DISSIPATION (mw): ACTUAL AMBIENT T_A (9)	AVG PWR DISSIPATION (mw): ACTUAL CASE T_C (10)	AVG PWR DISSIPATION (mw): ACTUAL (11)	POWER RATIO: ACTUAL/RATED 25°C (Amb.or case) (12)	POWER RATIO: ACTUAL/RATED T_A or T_C (13)	MAXIMUM VOLTAGES: V_{CBO} RATED V (14)	MAXIMUM VOLTAGES: V_{CB} ACTUAL V (15)	MAXIMUM VOLTAGES: V_{CEO} RATED V (16)	MAXIMUM VOLTAGES: V_{CE} ACTUAL V (17)	DIODE PIV: RATED V (18)	DIODE PIV: ACTUAL V (19)	CIRCUIT FUNCTION or APPLICATION (20)	PART SPECIAL ENVIRONMENT (Define) (21)	FOR RELIABILITY USE ONLY: RATE (%/1000 HRS) (22)	SOURCE (See below) (23)	FAIL. RATE (24)	MULTIPLIER (25)	FINAL FAIL. RATE (%/1000 HRS)	TOTAL PER TYPE (26)	COUNT (27)	TOTAL FAILURE RATE (%/1000 HRS)
CR1	HP 0300		200°				3.75			NEG	NEG										Lunar		A						.004
CR2	HP 0300		200°				3.75			NEG	NEG												A						.004

(28) FAILURE RATE SOURCE (See Column 23)

A Vendor C

B D

(29) NOTE: It is assumed the transient and peak power does not exceed the safe limit.

(30) TOTAL FAILURE RATE .008 %/1000 HRS.

BS-321A

PARTS APPLICATION ANALYSIS

(CONNECTORS)

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Freq. Mult.

SCHEMATIC NO: NA

(Connectors)

1 CIRCUIT, REF. DESIGNATION	2 TYPE DESIGNATION (CEC, MIL OR MFR) AND CONSTRUCTION	3 MANUFACTURER	PINS: 4 NUMBER TOTAL	5 NUMBER ACTIVE	6 CURRENT RATED	7 CURRENT ACTUAL MAX.	8 CURRENT ACTUAL MIN.	9 VOLTAGE BETWEEN PINS RATED	10 VOLTAGE BETWEEN PINS ACTUAL	11 VOLTAGE BETWEEN PINS TRANSIENT	12 VOLTAGE ACROSS THE CONTACT STEADY STATE	13 VOLTAGE ACROSS THE CONTACT SURGE	14 AMBIENT TEMP °C	15 INSERT MATL	16 GUIDE	17 NO. OF INSERTIONS DURING LIFE	18 MISCELLANEOUS REMARKS	19 BASIC FAILURE RATE %/1000 Hours	20 SOURCE OF F.R. (See 24)	21 F.R. MODIFIER	22 TOTAL FAILURE RATE (%/1000 Hours)
J1	OSM		2	2		NEG							LUNAR						A		.0002
J2	OSM		2	2		NEG													A		.0002
JX	Hughes		14	12		NEG													A		.0015

23 REQUIRED LIFE HOURS

24 FAILURE RATE SOURCES (FOR COLUMN 20)
A Mil HDBK 217A B
C D

25 CALCULATED MTBF HOURS

26 TOTAL FAILURE RATE .0019 %/1000 HOURS

DRD P283

(BS-321A

PARTS APPLICATION ANALYSIS

(MISC. PARTS)

ATM 841

PROJECT: ALSEP

DATE: 9-22-69

ASSEMBLY: S-Band Transmitter

SUB ASSEMBLY: Freq. Mult.

SCHEMATIC NO: NA

(Misc. Parts)

CIRCUIT SYMBOL NUMBER 1	TYPE DESIGNATION (CEC, MIL OR MFR) and CONSTRUCTION 2	MANUFACTURER 3	TEMPERATURE RANGE MAX 4	TEMPERATURE RANGE MIN 5	ELECTRICAL STRESS RATED 6	ELECTRICAL STRESS USE 7	PERCENT DUTY CYCLE 8	MAJOR CHARACTERISTICS and APPLICATION 9	FOR RELIABILITY USE ONLY: BASIC FAILURE RATE (%/1000 HOURS) at ___°C 10	FOR RELIABILITY USE ONLY: SOURCE (SEE #15) 11	FOR RELIABILITY USE ONLY: PART SPECIAL ENVIRONMENT (DEFINE) 12	FOR RELIABILITY USE ONLY: FAILURE RATE MULTIPLIER 13	FOR RELIABILITY USE ONLY: TOTAL FAILURE RATE (%/1000 HOURS) 14
RT1	Sensistor									A			.003
RT2	Sensistor									A			.003
RT3	Sensistor									A			.003
	Tuned Cavity									A			.01

15 FAILURE RATE SOURCES (FOR COLUMN 11)
A. MIL HDRK 217A B. ____
C. ____ D. Mil Std 217 Chart XXIV

16 CALCULATED MTBF ____ HOURS

17 TOTAL FAILURE RATE .019 %/1000 HOURS

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